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EXAMINER

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/761,073
Filing Date: January 20, 2004
Appellant(s): STEELY ET AL.

Gary J. Pitzer
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 12/5/07 appealing from the Office action mailed 3/29/07.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The following are the related appeals, interferences, and judicial proceedings known to the examiner which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal:

10/760,640

10/760,813

10/760,599

10/760,652

10/760,659

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

2002/0129211	Arimilli et al.	9-2002
6,138,218	Arimilli et al.	10-2000
6,883,070	Martin et al.	4-2005

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-9, 12-14, 16-22, 25-29, 31-37 and 39-40 are rejected under 35 U.S.C. 102(b) as being anticipated by Arimilli et al. (US 2002/0129211).

As per **claim 1**, Arimilli discloses

A system comprising:

“a first node that provides a source broadcast request for data, the first node being operable to respond in a first manner to other source broadcast requests for the data while the source broadcast request for the data is pending at the first node;” as [**“a plurality of agents coupled to an interconnect...in response to snooping the transaction, a second agent provides a snoop response indicating that the second agent has a pending conflict store request” and explains that “master 26 prevents access to the target cache line by other agents 10 by means of appropriate snoop responses until the store into cache array 24 is completed” (Pages 1-2, Paragraph 0012; Page 4, Paragraphs 0035-0038)**]

“the first node being operable to respond in a second manner to the other source broadcast requests for the data in response to receiving an ownership data response at the first node” [**With respect to this limitation, Arimilli discloses “and a coherency decision point provides a snoop response granting the first agent ownership of the data” (Pages 1-2, Paragraph 0012; Page 4, Paragraphs 0035-0038)**]

the ownership data response comprising a copy of the data [**“The one or more shared cache coherency states may optionally include a shared-owner state that designates a single owner of a potentially shared cache line” (Page 2, Par. 0024)**]

and explains that “master 26 of a first agent, for example, processor complex 10a issues a modifying transaction 150a (i.e., Dclaim or RWITM)” (Page 3, Par. 0029) wherein this processor is granted ownership of the cache line and is designated as OWNER or OWNER_CU (See Table III in Page 6) wherein “The RWITM transaction requests that the initiating agent be provided an up-to-date copy of a target cache line and that other agents invalidate their copies of the cache line, if any” (Page 1, Par. 0006); therefore, disclosing “an ownership response comprising a copy of the data”].

Arimilli explicitly discloses [“master 26” in the system receives store requests for cache lines wherein “master 26 handles the store request according to the coherency state associated with the request address in the cache directory 22... if, however, cache directory 22 indicates the target cache line identified by the request address is invalid... master 26 issuing a RWITM transaction on system bus 12 to obtain a copy of the cache line from another agent 10 for modification” (Page 4, Par. 0035); therefore, as master issues a “RWITM” transaction for data and data is transferred from an agent that has previously modified a cache line to the agent that intends to modify this cache line in order to provide this agent requesting ownership the most-current data in the system, master is issuing an ownership response request comprising a copy of the data as claimed by Applicant].

As per **claim 2**, Arimilli discloses the system of claim 1, **[See rejection to claim 1 above]** “wherein the ownership data response comprises an indication to the first node that the data associated with the ownership data response comprises migratory data” **[Arimilli discloses this concept as “master receives a store request from processor 16... master 26 sets its Dclaim pending flag and initiates a Dclaim transaction on system bus 12 to obtain ownership of the target cache line from the CDP” wherein “a shared state (defined herein as any state indicating that identical data may be held in another cache14)” (Figure 3A; Page 4, Paragraphs 0035-0036)]**.

As per **claims 3 and 4**, Arimilli discloses the system of claim 2, **[See rejection to claim 2 above]** “wherein the migratory data comprises a cache ordering point for serializing source broadcast requests for the data, the cache ordering point migrating to the first node from a node that provides the ownership data response” **[Arimilli discloses this concept as “in addition, to maintain coherency, master 26 performs clean-up operations to invalidate other (now stale) copies of the target cache line, if any, held by other agents 10, and further, to ensure that the associated snoopers 28 provides snoop responses informing masters 26, if any, that lost the arbitration to downgrade their Dclaim transactions to RWITM transactions... while master 26 is issuing these Kill transactions, the associated snoopers 28 provides NACK snoop responses to Dclaim transactions of losing masters 26 that did not receive a NACK snoop response” (Page 4, Paragraph 0038; Table I)]**.

As per **claim 5**, Arimilli discloses the system of claim 1, **[See rejection to claim 1 above]** wherein “the source broadcast request from the first node comprises a source broadcast read request, the first node, when responding in the first manner, provides a first response to the other source broadcast requests for the data indicating that the first node has a conflicting read request for the data” **[Arimilli discloses this concept as “coordination of accesses satisfied by multiple possible data sources to ensure that read and write accesses to each system memory address are ordered such that agents requesting read access receive correct data” (Page 1, Paragraph 0005) and explains that “master 26 prevents access to the target cache line by other agents 10 by means of appropriate snoop responses until the store into cache array 24 is completed” wherein “a master intends to modify a shared cache line held in its associated cache and that the other agents should invalidate their cached copies of the cache line... master 26 performs clean-up operations to invalidate other (now stale) copies of the target cache line held by other agents 10” (Pages 1-2, Paragraph 0012; Page 4, Paragraphs 0035-0038)].**

As per **claim 6**, Arimilli discloses the system of claim 5, **[See rejection to claim 5 above]** further comprising “a second node that provides one of the other source broadcast requests for the data and receives the first response from the first node, the second node being operative to fill a shared copy of data received from a third node in response to the one of the other source broadcast requests for the data” **[With respect**

to this limitation, Arimilli discloses having “agents 10” (Figure 1) and explains that “the first agent is permitted to modify data. To maintain coherency, the first agent also invalidates other cached copies of the data, if any” (Pages 1-2, Paragraph 0012) wherein a single-owner may modify a cache line at a time (Page 2, Paragraph 0024) wherein “a conflict arises if during interval 160, the master 26 of a second agent 10 (and possibly one or more agents 10) develops, or has previously developed and manifests, at any time during interval 160 an intention to modify the target cache line” (Page 3, Paragraph 0029)].

As per **claim 7**, Arimilli discloses the system of claim 5, **[See rejection to claim 5 above]** further comprising “a second node that provides one of the other source broadcast requests for the data and receives the first response from the first node, the second node being operative to fill a copy of data received from a home node for the data” **[The rationale in the rejection of claim 6 is incorporated herein]**.

As per **claim 8**, Arimilli discloses the system of claim 1, **[See rejection to claim 1 above]** wherein “the first node, when responding in the second manner, provides a second response to the other source broadcast requests for the data indicating that the source broadcast request from the first node is a conflicting request for the data and that migration of the data to the first node is in progress” **[With respect to this limitation, Armilli discloses “response logic 30 combines the snoop response of the CDP with the snoop responses of the other agents 10 to produce a combined**

response. In the case of multiple conflicting requests shown in FIG. 2, the combined response informs an agent 10 that issued a transaction whether or not it won the arbitration performed by the CDP and is the new owner of the target cache line... the granting CDP protects ownership of target cache line by providing snoop responses denying ownership to other agents that issue conflicting responses” (Pages 3-4, Paragraphs 0032-0033) and explains that “master 26 prevents access to the target cache line by other agents 10 by means of appropriate snoop responses until the store into the cache array 24 is completed” (Page 4, Paragraph 0036)].

As per **claim 9**, Arimilli discloses the system of claim 8, **[See rejection to claim 8 above]** further comprising “a second node that provides one of the other source broadcast requests for the data and receives the second response from the first node, the second node being operative to employ a copy of the data received from a third node for only a single use” **[Arimilli discloses this concept as “coherency protocols typically require that only a single agent can own each line at any given time for purposes of modification” (Page 3, Paragraph 0033)].**

As per **claims 12 and 17**, Arimilli discloses the system of claims 1 and 16, **[See rejection to claim 1 above and rejection to claim 16 below]** wherein “the first node employs an invalidate line command to other nodes of the system to remove incorrect copies of the data and any stale copies of the data cached at the other nodes of the

system” **[Arimilli discloses this limitation as “to maintain coherency, master 26 performs clean-up operations to invalidate other (now stale) copies of the target cache line, if any, held by other agents 10... master 26 invalidates other copies of the target cache line by issuing high-priority Kill transactions on system bus 12 until all other agents provide Null snoop responses indicating that other copies of the cache line have been invalidated” (Page 4, Paragraph 0038)].**

As per **claim 13**, Arimilli discloses the system of claim 1, **[See rejection to claim 1 above]** wherein the source broadcast request provided by the first node is broadcast using a source broadcast cache coherency protocol **[Arimilli discloses this concept as agents snoop to use resources (Pages 1-2, Paragraphs 0011-0012; Figure 4)].**

As per **claim 14**, Arimilli discloses the system of claim 1, **[See rejection to claim 1 above]** wherein “the first node defines a processor having an associated cache, the associated cache of the processor comprising a plurality of cache lines, each cache line having a respective tag address that identifies associated data and each cache line having state information that indicates a state of the associated data for the respective cache line,” **[With respect to this limitation, Arimilli discloses cache lines having tag fields (Pages 2-3, Paragraphs 0023 and 0025; Figure 1)]**
“the processor being capable of communicating with other nodes of the system through an interconnect,” **[Arimilli discloses this limitation as “a plurality of agents coupled to an interconnect” (Page 1, Paragraph 0012; Figure 1)]**

“the system further comprising a cache controller associated with the processor, the cache controller being operative to manage data requests and responses for the associated cache of the processor, the cache controller effecting state transitions associated with the data in the associated cache of the processor based on the data requests and responses for the associated cache of the processor” **[Arimilli discloses this limitation as “master 26” and “snooper 28” (Pages 2-3; Paragraphs 0024-0026; Figure 1) wherein “in addition, to maintain coherency, master 26 performs clean-up operations to invalidate other (now stale) copies of the target cache line, if any, held by other agents” and explains that “while master 26 is issuing these Kill transactions, the associated snooper 28 provides NACK snoop responses to Dclaim transactions of losing masters 26 that did not receive an NACK snoop response” (Page 4, Paragraph 0038)].**

As per **claim 16**, Arimilli discloses

A multi-processor network comprising: as **[“data processing system 8” (Figure 1)]**
“a source processor node that provides a source broadcast read request for data; the source processor node issuing an invalidate line command to other processor nodes of the system in response to receiving a data response that transfers a cache ordering point for the data to the source processor node” **[Arimilli discloses this concept as “a plurality of agents coupled to an interconnect...in response to snooping the transaction, a second agent provides a snoop response indicating that the second agent has a pending conflict store request” and explains that “master 26**

prevents access to the target cache line by other agents 10 by means of appropriate snoop responses until the store into cache array 24 is completed” (Pages 1-2, Paragraph 0012; Page 4, Paragraphs 0035-0038) and explains “and a coherency decision point provides a snoop response granting the first agent ownership of the data” (Pages 1-2, Paragraph 0012; Page 4, Paragraphs 0035-0038) wherein “a conflict arises if, during interval 160, the master 26 of a second agent 10 (and possibly one or more additional agents 10) develops, or has previously developed and manifests at any time during interval 160 an intention to modify the target cache line” (Page 3, Paragraph 0029) “master 26 invalidates other copies of the target cache line by issuing high-priority Kill transactions... while master 26 is issuing these Kill transactions, the associated snoopers 28 provides NACK snoop responses to Dclaim transactions of losing masters 26 that did not receive an NACK snoop response” (Page 4, Paragraph 0038)]

“the first node being operable to respond in a second manner to the other source broadcast requests for the data in response to receiving an ownership data response at the first node” [With respect to this limitation, Arimilli discloses “and a coherency decision point provides a snoop response granting the first agent ownership of the data” (Pages 1-2, Paragraph 0012; Page 4, Paragraphs 0035-0038)]

the ownership data response comprising a copy of the data [“The one or more shared cache coherency states may optionally include a shared-owner state that designates a single owner of a potentially shared cache line” (Page 2, Par. 0024) and explains that “master 26 of a first agent, for example, processor complex 10a

issues a modifying transaction 150a (i.e., Dclaim or RWITM)” (Page 3, Par. 0029) wherein this processor is granted ownership of the cache line and is designated as OWNER or OWNER_CU (See Table III in Page 6) wherein “The RWITM transaction requests that the initiating agent be provided an up-to-date copy of a target cache line and that other agents invalidate their copies of the cache line, if any” (Page 1, Par. 0006); therefore, disclosing “an ownership response comprising a copy of the data”].

Arimilli explicitly discloses [“master 26” in the system receives store requests for cache lines wherein “master 26 handles the store request according to the coherency state associated with the request address in the cache directory 22... if, however, cache directory 22 indicates the target cache line identified by the request address is invalid... master 26 issuing a RWITM transaction on system bus 12 to obtain a copy of the cache line from another agent 10 for modification” (Page 4, Par. 0035); therefore, as master issues a “RWITM” transaction for data and data is transferred from an agent that has previously modified a cache line to the agent that intends to modify this cache line in order to provide this agent requesting ownership the most-current data in the system, master is issuing an ownership response request comprising a copy of the data as claimed by Applicant].

As per claims 18 and 26, Arimilli discloses the multi-processor network of claim 16, [See rejection to claim 16 above] wherein “the source processor node is operative

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to provide a first conflict response to source broadcast requests for the data from the other processor nodes prior to receiving the data response that transfers the cache ordering point for the data to the source processor node, the source processor node being operative to provide a second conflict response to at least one source broadcast request for the data from at least one of the other processor nodes in response to the source processor node receiving a conflict response and receiving the data response that transfers the cache ordering point for the data to the source processor node”

[Arimilli discloses this concept as “a plurality of agents coupled to an interconnect...in response to snooping the transaction, a second agent provides a snoop response indicating that the second agent has a pending conflict store request” and explains that “master 26 prevents access to the target cache line by other agents 10 by means of appropriate snoop responses until the store into cache array 24 is completed” (Pages 1-2, Paragraph 0012; Page 4, Paragraphs 0035-0038) and explains “and a coherency decision point provides a snoop response granting the first agent ownership of the data” (Pages 1-2, Paragraph 0012; Page 4, Paragraphs 0035-0038) wherein “a conflict arises if, during interval 160, the master 26 of a second agent 10 (and possibly one or more additional agents 10) develops, or has previously developed and manifests at any time during interval 160 an intention to modify the target cache line” (Page 3, Paragraph 0029) “master 26 invalidates other copies of the target cache line by issuing high-priority Kill transactions... while master 26 is issuing these Kill transactions, the associated snoopers 28 provides NACK snoop responses to

Dclaim transactions of losing masters 26 that did not receive an NACK snoop response” (Page 4, Paragraph 0038)].

As per **claim 19**, Arimilli discloses the system of claim 18, **[See rejection to claim 18 above]** wherein “the source processor node provides the first response to the source broadcast requests for the data from the other processor nodes when the source processor node has a pending conflicting read request for the data” **[The rationale of claim 5 is herein incorporated]**.

As per **claims 20 and 27-28**, Arimilli discloses the system of claim 19, **[See rejection to claim 19 above]** wherein “the other processor nodes receiving the first response from the source processor node are operative to fill a copy of the data received from at least one of the other processor nodes and from system memory” **[The rationale of claim 6 is herein incorporated]**.

As per **claim 21**, Arimilli discloses the system of claim 18, **[See rejection to claim 18 above]** wherein “the source processor node provides the second response in response to the source processor node receiving a request for the data that conflicts with the source broadcast request for the data after migration of the copy of the data to the source processor node has begun” **[Arimilli discloses this concept as “while master 26 is issuing these Kill transactions, the associated snoopers 28 provides NACK snoop responses to Dclaim transactions of losing masters 26 that did not**

receive an NACK snoop response during interval 12” (Page 4, Paragraph 0038)].

Arimilli also discloses [“The one or more shared cache coherency states may optionally include a shared-owner state that designates a single owner of a potentially shared cache line” (Page 2, Par. 0024) and explains that “master 26 of a first agent, for example, processor complex 10a issues a modifying transaction 150a (i.e., Dclaim or RWITM)” (Page 3, Par. 0029) wherein this processor is granted ownership of the cache line and is designated as OWNER or OWNER_CU (See Table III in Page 6) wherein “The RWITM transaction requests that the initiating agent be provided an up-to-date copy of a target cache line and that other agents invalidate their copies of the cache line, if any” (Page 1, Par. 0006); therefore, disclosing “an ownership response comprising a copy of the data”].

Arimilli explicitly discloses [“master 26” in the system receives store requests for cache lines wherein “master 26 handles the store request according to the coherency state associated with the request address in the cache directory 22... if, however, cache directory 22 indicates the target cache line identified by the request address is invalid... master 26 issuing a RWITM transaction on system bus 12 to obtain a copy of the cache line from another agent 10 for modification” (Page 4, Par. 0035); therefore, as master issues a “RWITM” transaction for data and data is transferred from an agent that has previously modified a cache line to the agent that intends to modify this cache line in order to provide this agent requesting ownership the most-current data in the system, master is issuing an

ownership response request comprising a copy of the data as claimed by Applicant].

As per **claims 22 and 29**, Arimilli discloses the system of claim 21, **[See rejection to claim 21 above]** wherein “one of the other processor nodes comprises a second processor node that provides a respective one of the other source broadcast requests for the data and receives the second response from the first node, the second processor node being operative to employ a copy of the data received from a third node for a single use” **[The rationale of claim 9 is herein incorporated]**.

As per **claim 25**, Arimilli discloses “A system comprising: means for broadcasting a source broadcast request for data from a first node; and means for issuing from the first node an invalidate line command to other nodes of the system in response to receiving a conflict response from at least one other node in the system and a data response transferring a cache ordering point for the data to the first node” **[The rationale in the rejection of claim 16 is herein incorporated]**.

As per **claim 31**, Arimilli discloses “A system comprising: means for broadcasting a source broadcast request for data from a first node; means for providing from the first node a first conflict response to other source broadcast requests for the data from other nodes while the source broadcast for the data is pending at the first node; and means for providing a second conflict response to the other source broadcast

requests for the data from the other nodes after receiving an ownership data response at the first node while the source broadcast for the data is pending at the first node”

[The rationale in the rejection of claim 1 is herein incorporated. Arimilli further explains that “a conflict arises if, during interval 160, the master 26 of a second agent 10 (and possibly one or more additional agents 10) develops, or has previously developed and manifests at any time during interval 160 an intention to modify the target cache line” (Page 3, Paragraph 0029) “master 26 invalidates other copies of the target cache line by issuing high-priority Kill transactions... while master 26 is issuing these Kill transactions, the associated snoop 28 provides NACK snoop responses to Dclaim transactions of losing masters 26 that did not receive an NACK snoop response” (Page 4, Paragraph 0038)]

the ownership data response comprising a copy of the data **[“The one or more shared cache coherency states may optionally include a shared-owner state that designates a single owner of a potentially shared cache line” (Page 2, Par. 0024) and explains that “master 26 of a first agent, for example, processor complex 10a issues a modifying transaction 150a (i.e., Dclaim or RWITM)” (Page 3, Par. 0029) wherein this processor is granted ownership of the cache line and is designated as OWNER or OWNER_CU (See Table III in Page 6) wherein “The RWITM transaction requests that the initiating agent be provided an up-to-date copy of a target cache line and that other agents invalidate their copies of the cache line, if any” (Page 1, Par. 0006); therefore, disclosing “an ownership response comprising a copy of the data”].**

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Arimilli explicitly discloses [**“master 26” in the system receives store requests for cache lines wherein “master 26 handles the store request according to the coherency state associated with the request address in the cache directory 22... if, however, cache directory 22 indicates the target cache line identified by the request address is invalid... master 26 issuing a RWITM transaction on system bus 12 to obtain a copy of the cache line from another agent 10 for modification”** (Page 4, Par. 0035); therefore, as master issues a “RWITM” transaction for data and data is transferred from an agent that has previously modified a cache line to the agent that intends to modify this cache line in order to provide this agent requesting ownership the most-current data in the system, master is issuing an ownership response request comprising a copy of the data as claimed by Applicant].

As per **claim 32**, Arimilli discloses the system of claim 31, [**See rejection to claim 31 above**] further comprising “means for cleaning-up incorrect copies of the data and stale copies of the data filled at other nodes of the system in response to receiving the ownership data response at the first node” [**With respect to this limitation, Arimilli discloses “master 26 must perform clean-up operations to ensure coherency”** (Page 7, Paragraphs 0038 and 0058)].

As per **claim 33**, Arimilli discloses the system of claim 31, [**See rejection to claim 31 above**] further comprising “means for issuing an invalidate line command to

the other nodes of the system in response to receiving the ownership data response at the first node” **[With respect to this limitation, Arimilli discloses “master 26 invalidates other copies of the target cache line by issuing high-priority Kill transactions” (Page 4, Paragraph 0038)].**

As per **claim 34**, Arimilli discloses “A method comprising: migrating a line of data cache ordering point for a line of data from a first node of a system to a second node of a system; and issuing an invalidate line command for the line of data from the second node to other nodes of the system in response to receiving a conflict response from at least one other node in the system and to the cache ordering point migrating from the first node to the second node” **[The rationale of claim 1 is herein incorporated. Arimilli further discloses “a conflict arises if, during interval 160, the master 26 of a second agent 10 (and possibly one or more additional agents 10) develops, or has previously developed and manifests at any time during interval 160 an intention to modify the target cache line” (Page 3, Paragraph 0029) “master 26 invalidates other copies of the target cache line by issuing high-priority Kill transactions... while master 26 is issuing these Kill transactions, the associated snoopers 28 provides NACK snoop responses to Dclaim transactions of losing masters 26 that did not receive an NACK snoop response” (Page 4, Paragraph 0038)].** Arimilli further explains **[“The one or more shared cache coherency states may optionally include a shared-owner state that designates a single owner of a potentially shared cache line” (Page 2, Par. 0024) and explains that “master 26 of**

a first agent, for example, processor complex 10a issues a modifying transaction 150a (i.e., Dclaim or RWITM)” (Page 3, Par. 0029) wherein this processor is granted ownership of the cache line and is designated as OWNER or OWNER_CU (See Table III in Page 6) wherein “The RWITM transaction requests that the initiating agent be provided an up-to-date copy of a target cache line and that other agents invalidate their copies of the cache line, if any” (Page 1, Par. 0006); therefore, disclosing “an ownership response comprising a copy of the data”] and explicitly discloses [“master 26” in the system receives store requests for cache lines wherein “master 26 handles the store request according to the coherency state associated with the request address in the cache directory 22... if, however, cache directory 22 indicates the target cache line identified by the request address is invalid... master 26 issuing a RWITM transaction on system bus 12 to obtain a copy of the cache line from another agent 10 for modification” (Page 4, Par. 0035); therefore, as master issues a “RWITM” transaction for data and data is transferred from an agent that has previously modified a cache line to the agent that intends to modify this cache line in order to provide this agent requesting ownership the most-current data in the system, master is issuing an ownership response request comprising a copy of the data as claimed by Applicant].

As per claim 35, Arimilli discloses the method of claim 34, [See rejection to claim 34 above] further comprising: “providing a first conflict response from the second

node to requests for the line of data from the other nodes of the system prior to the cache ordering point migrating from the first node to the second node; and providing a second conflict response from the second node to requests for the line of data from the other nodes after the cache ordering point migrates from the first node to the second node” **[The rationale of claim 18 is herein incorporated]**.

As per **claim 36**, Arimilli discloses the method of claim 35, **[See rejection to claim 35 above]** further comprising: “enabling a shared copy of the line of data to be filled at one of the other nodes of the system in response to receiving the first conflict response from the second node and a data response from at least another node of the system; and enabling a copy of the line of data received from system memory to be filled at one of the other nodes of the system in response to receiving the first conflict response from the second node” **[Arimilli discloses this concept as “data associated with a target address are cached at a first agent among the plurality of agents in a shared state... a coherency decision point provides a snoop response granting the first agent ownership of the data... the first agent is permitted to modify the data... to maintain coherency, the first agent also invalidates other cached copies of the data... the coherency decision point at the first agent preferably protect the first agent’s ownership of the data by providing appropriate snoop responses to conflicting transactions” (Pages 1-2, Paragraphs 0012-0013)]**.

As per **claim 37**, Arimilli discloses the method of claim 35, **[See rejection to claim 35 above]** further comprising “enabling a shared copy of the line of data to be filled at least one of the other nodes of the system for a single use by the at least one of the other nodes of the system in response to receiving the second conflict response from the first node” **[The rationale of claim 9 is herein incorporated]**.

As per **claim 39**, Arimilli discloses “A method comprising: providing a first conflict response from a first node to source broadcast requests for data from other nodes while a source broadcast request for the data is pending at the first node; and providing a second conflict response from the first node to the other source broadcast requests for the data from the other nodes in response to receiving a conflict response and an ownership data response at the first node” **[The rationale of claim 31 is herein incorporated]**.

As per **claim 40**, Arimilli discloses “A computer system comprising a plurality of nodes, the plurality of nodes employing a cache coherency protocol operative to migrate a cache ordering point for a line of data from a target node to a source node in response to a source broadcast read request for the line of data issued by the source node, the source node being operative to invalidate the line of data at other nodes of the computer system in response to receiving a conflict response and migratory data to the source broadcast read request” **[The rationale of claim 34 is herein incorporated]**.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 10-11, 23-24, 30 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arimilli et al. (US 20020129211) in view of Arimilli et al. (US 6,138,218).

As per **claims 10, 23, 30 and 38**, Arimilli discloses the system of claims 8, 21, 26 and 35 **[See rejection to claims 8, 21, 26 and 35 above]** further comprising “a second node that provides one of the other source broadcast requests for the data and receives the second response from the first node,” as **[Arimilli discloses this concept as “if snoopers 28 determine that the target cache line is invalid in cache directory 22 and that the Dclaim pending flag of the associated master 26 is set, snoopers 28 belong to an agent 10 whose master 26 lost arbitration for ownership of the target cache line... snoopers 28 therefore provide a RETRY SR” (Page 5, Paragraphs 0043-0045)]**

Arimilli (US 2002/0129211) does not disclose expressly “the second node being operative to employ a forward progress technique to obtain the data.”

Arimilli (US 6,138,218) discloses “the second node being operative to employ a forward progress technique to obtain the data” **[Column 6, lines 39-45 and 54-64]**.

Arimilli et al. (US 2002/0129211) and Arimilli et al. (US 6,138,218) are analogous art because they are from the same field of endeavor of computer memory access and control.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the multiprocessor memory system that provides broadcast/snoops requests to maintain data coherency as taught by Arimilli (US 2002/0129211) and further employ a forward progress technique to obtain the data when broadcasts/snooping are not successful as taught by Arimilli (US 6,138,218).

The motivation for doing so would have been because Arimilli (US 6,138,218) discloses employing a forward process technique to resolve the transaction if the source broadcast/snooping protocol cannot provide a deterministic resolution of the transaction **[(Column 6, lines 39-45 and 54-64)]** to obviate the need for subsequent interventions or snoop/broadcast retries **[(Column 6, lines 48-50)]**.

Therefore, it would have been obvious to combine Arimilli et al. (US 6,138,218) with Arimilli et al. (US 2002/0129211) for the benefit of creating a memory system to obtain the invention as specified in claims 10, 23, 30 and 38.

As per **claims 11 and 24**, the combination of Arimilli (US 2002/0129211) and Arimilli et al. (US 6,138,218) discloses the system of claims 10 and 23, **[See rejection to claims 10 and 23 above]** wherein “the forward progress technique comprises a forward progress cache coherency protocol” **[The rationale in the rejection of claim 10 is herein incorporated]**.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arimilli et al. (US 2002/0129211) in view of Arimilli et al. (US 6,138,218) and Martin et al. (US 6,883,070).

1. As per **claim 15**, Arimilli (US 20020129211) discloses the system of claim 1, **[See rejection to claim 1 above; the rationale of claim 1 is herein incorporated]** wherein “the first node employs a source broadcast-based protocol to issue the source broadcast request for the data,” **[Arimilli (US 20020129211) discloses this concept as agents snoop to use resources (Pages 1-2, Paragraphs 0011-0012; Figure 4)]** but does not disclose expressly implementing “a hybrid cache coherency protocol the first node employing an associated forward progress protocol to reissue a request for the data in response to the request failing in the source broadcast protocol.”

Arimilli (US 6,138,218) discloses “the second node being operative to employ a forward progress technique to obtain the data to reissue a request for the data in response to the request failing in the source broadcast protocol” **[Column 6, lines 39-45 and 54-64]** but does not disclose expressly using a hybrid cache coherency protocol.

Martin discloses a multi-processor system comprising at least one node that employs a hybrid coherency protocol, the hybrid coherency protocol employing a forward progress protocol to resolve the transaction **[(Abstract; Column 1, lines 38-50)]**.

Arimilli et al. (US 2002/0129211), Arimilli et al. (US 6,138,218) and Martin et al. (U 6,883,070) are analogous art because they are from the same field of endeavor of computer memory access and control.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to modify the multiprocessor memory system that provides broadcast/snoops requests to maintain data coherency as taught by Arimilli (US 2002/0129211); employ a forward progress technique to obtain the data when broadcasts/snooping are not successful as taught by Arimilli (US 6,138,218) and further use a hybrid cache coherency protocol as taught by Martin.

The motivation for doing so would have been because Arimilli (US 6,138,218) discloses employing a forward process technique to resolve the transaction if the source broadcast/snooping protocol cannot provide a deterministic resolution of the transaction **[(Column 6, lines 39-45 and 54-64)]** to obviate the need for subsequent interventions or snoop/broadcast retries **[(Column 6, lines 48-50)]** and Martin discloses **[using a hybrid coherency protocol employing a forward process protocol to provide a hybrid protocol that is sensitive to the bandwidth available for communication of cache protocol messages (Column 2, lines 27-30)]**.

Therefore, it would have been obvious to combine Martin et al. (US 6,883,070), Arimilli et al. (US 6,138,218) with Arimilli et al. (US 2002/0129211) for the benefit of creating a memory system to obtain the invention as specified in claim 15.

(10) Response to Argument

The Examiner would like to point out that the claim language presented in the instant application is broad as many of the terms in the pending claims are not defined within the scope of the claims, therefore, any limitations appearing in the Specification but not recited in the claims have not been read into the claims and Examiner has interpreted these terms according to the broadest reasonable interpretation as follows (See M.P.E.P. 2111 [R-1]).

A. 35 U.S.C. 102(b) rejection of claims 1-9, 12-14, 16-22, 25-29, 31-37 and 39-40 as being anticipated by Arimilli

Claim 1

Appellant argues Arimilli does not disclose a source broadcast request for data because first agent already has the data; this argument has been fully considered but it is not persuasive.

First, it appears to the Examiner that Applicant is reading limitations from the specification into the claims; the claims require "a source broadcast request for data" and nothing in the claims further limits/defines this limitation so as to prevent an agent

sending "a source broadcast request for data" from already having a copy of that data; this limitation is not being claimed.

Arimilli clearly teaches a source broadcast request for data as [**"a first agent... issues a modifying transaction 150a (i.e., Dclaim or RWITM) (which correspond to the claimed source broadcast request for data) on system bus 12 that targets a cache line that is indicated as shared in the cache directory 22 of at least one agent 10"** (Par. 0029) and explains **"one or more transactions may be issued by agents 10 on system bus 12"** (Par. 0021) and **"data processing system 8 that employ a system bust architecture that permits all agents 10 to receive each transaction, snoop response, and combined response at substantially the same time"** (Par. 0028) *(wherein as all agents 10 receive the modifying transaction, this transaction is being broadcast)*] wherein the modifying transaction is broadcast/sent to all agent(s) having the cache line to be modified by the first agent in a shared state wherein these agent(s) send snoop responses to the first agent in order to process the granting of ownership to the first which will allow the first agent to modify the cache line since an agent must own the cache line in order to modify it; thereby, a first agent sends a source broadcast request for data, as broadly claimed.

Furthermore, Arimilli clearly teaches a source broadcast request for data which obtains a copy of data as a read with intent to modify (RWITM) is one of the modifying transactions *(which correspond to the claimed source broadcast request for data)* that an agent issues wherein it is clearly explained that [**"FIG. 3B, which illustrates master 26 issuing a RWITM transaction on system bus 12 to obtain a copy (which**

comprises a request for data) of the cache line from another agent 10 for modification” (Par. 0035)].

Appellant argues Arimilli does not teach first and second manners of responding since in Arimilli the CDP, not the first agent protects the grant of ownership until the combined response is received at the first agent.

The claims broadly require “the first node being operable to respond in a first manner to other source broadcast requests for the data while the source broadcast request for the data is pending at the first node” and “the first node being operable to respond in a second manner... in response to receiving an ownership data response...” wherein Appellant should note that the limitation of “the first agent protecting grant of ownership while the source broadcast request for data is pending at the first node” is not being claimed.

Arimilli clearly discloses “the first node being operable to respond in a first manner to other source broadcast requests for the data while the source broadcast request for the data is pending at the first node” as **[every agent is able to provide snoop responses indicating conflicting requests (Par. 0012 and 0035-0038) and explains “snooper 28 at block 130 that the associated master 26 has a pending conflicting modifying request, snooper 28 provides a RETRY_notCDP SR (*which corresponds to responding in a first manner, as claimed*) to signify that the agent 10 has a pending conflicting request (*which corresponds to a pending request for***

***data, as claimed*) and believes it may ultimately be granted ownership of the target cache line” (Par. 0052)].**

Arimilli also discloses “the first node being operable to respond in a second manner to other source broadcasts for the data in response to receiving an ownership data response” as [**“master 26 (*in agent that has received ownership*) prevents access to the target cache line by other agents 10 by means of appropriate snoop responses (*which comprises a second manner of responding as claimed*) until the store into cache array 24 is completed” (Page 4, Par. 0036) wherein only the agent that owns a cache line can modify it and the coherency decision point (CDP) which “is the snoop of the agent 10 that holds the data of the target cache line in the highest state of ownership” protects ownership for the agent that owns the cache line (Pars. 0030-0032)].**

Furthermore, the Examiner submits the claims do not require that the first and second manners of responding be different; therefore, any manner of responding of a first node (*snoop responses*) as taught by Arimilli reads on the claimed first and second manners of responding.

Appellant argues Arimilli does not disclose ownership data response because ownership is granted to already cache data; however, the Examiner would like to respectfully point out that the this limitation is not being claimed as the claims broadly require “ownership data response” which is taught by Arimilli as [**the coherency decision point (CDP) which “is the snoop of the agent 10 that holds the data of**

the target cache line in the highest state of ownership” and explains “the CDP grants (*which clearly comprises an ownership data response*) ownership of the target cache line to other agents 10 by providing appropriate snoop responses to the transactions during the snoop response periods” (Pars. 0030-0032)].

Furthermore, Arimilli clearly teaches granting ownership to data that is not already cached as a RWITM transaction in which data must be obtained from another agent for modification [**“FIG. 3B, which illustrates master 26 issuing a RWITM transaction on system bus 12 to obtain a copy (*which comprises a request for data*) of the cache line from another agent 10 for modification” (Par. 0035)].**

Appellant argues Arimilli does not disclose a first node receiving ownership data response comprising a copy of the data; this argument has been fully considered but it is not persuasive.

Arimilli clearly discloses “a first node receiving ownership data response comprising a copy of the data” as [**“The one or more shared cache coherency states may optionally include a shared-owner state that designates a single owner of a potentially shared cache line” (Page 2, Par. 0024) and explains that “master 26 of a first agent, for example, processor complex 10a issues a modifying transaction 150a (i.e., Dclaim or RWITM)” (Page 3, Par. 0029) wherein this processor is granted ownership of the cache line and is designated as OWNER or OWNER_CU (See Table III in Page 6) wherein “The RWITM transaction requests that the initiating agent be provided an up-to-date copy (*which is clearly a copy of the data*)**

of a target cache line and that other agents invalidate their copies of the cache line, if any” (Page 1, Pars. 0006) wherein “FIG. 3B, which illustrates master 26 issuing a RWITM transaction on system bus 12 to obtain a copy (*wherein owner obtains a copy of the data as claimed*) of the cache line from another agent 10 for modification” (Par. 0035) wherein a master issues a “RWITM” transaction for data and data is transferred from an agent that has previously modified a cache line to the agent that intends to modify this cache line in order to provide this agent requesting ownership the most-current data in the system, master is issuing an ownership response request comprising a copy of the data as claimed by Applicant]. Furthermore, Appellant should note that in Arimilli, only the owner agent can modify a cache line; thereby, even newly modified data by an owner agent comprises a copy of the data, as broadly claimed.

Furthermore, Examiner would like to point out that the functional recitations of “the first node being [capable of or] operative to respond in a first manner and that the first node being [capable of or] operative to respond in a second manner do not make the claimed invention patentably distinct over the prior art of record. While features of a system may be recited either structurally or functionally, claims directed to a system must be distinguished from the prior art in terms of structure rather than function. *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997) (The absence of a disclosure in a prior art reference relating to function did not defeat the Board’s finding of anticipation of claimed apparatus because the limitations at issue

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were found to be inherent in the prior art reference); see also *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 228-29 (CCPA 1971); < *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). "System claims cover what a device *is*, not what a device *does*." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original).

Still further, claim 1 recites, inter alias, "the first node being operative to respond in a first manner... the first node being operative to respond in a second manner". While these limitations require "a first node", the functional recitations: "respond in a first manner" and "respond in a second manner" do not distinguish the claims from the prior art.

Claim 2

Appellant's arguments with respect to claim 2 parallel those presented with respect to claims 1. Accordingly, these arguments are addressed at least in the manner that claim 1 has been addressed above.

Claim 3

In response to Applicant's remark that Arimilli does not disclose a cache ordering point for serializing source broadcast requests for the data as nothing in Arimilli discloses the recited cache ordering migration in which the ordering point migrates to the first node from a node that provided the ownership data response.

This remark has been fully considered but it is not persuasive.

Applicant's Specification defines a cache ordering point as an owner processor or node serves as a cache ordering point wherein the owner processor responds to other processor with data to snoops for the data (Par. 0027) and Arimilli clearly discloses the a cache ordering point and cache ordering migration in which the ordering point migrates to the first node from a node that provided the ownership data response as **[the coherency decision point (CDP)** *(which corresponds to the claimed cache ordering point)* **which "is the snoopers of the agent 10 that holds the data of the target cache line in the highest state of ownership"** and explains **"the CDP grants** *(which clearly comprises an ownership data response)* **ownership of the target cache line to other agents 10 by providing appropriate snoop responses to the transactions during the snoop response periods"** wherein **"the combined response informs an agent 10 that issued a transaction whether or not it "won" the arbitration performed by the CDP and is the new owner of the target cache line (and also the new CDP in the preferred embodiment) "** (Pars. 0030-0032)] wherein in Arimilli, the new owner becomes the new CDP or cache ordering point; thereby migrating a cache ordering point to the new owner as claimed.

Furthermore, Arimilli discloses **[“master 26 handles the store request according to the coherency state associated with the request address in the cache directory 22... if, however, cache directory 22 indicates the target cache line identified by the request address is invalid... master 26 issuing a RWITM transaction on system bus 12 to obtain a copy of the cache line from another agent 10 for modification”** (Page 4, Par. 0035)]; therefore, as the copy of the valid

data is transferred to the owning processor thereby, the owner processor becoming the cache ordering point, as claimed.

Claim 4

Appellant's arguments with respect to claim 2 parallel those presented with respect to claims 4. Accordingly, these arguments are addressed at least in the manner that claim 4 has been addressed above.

Claim 5

Appellant argues that Arimilli does not disclose a source broadcast request for data because in Arimilli, the request is made for ownership of a shared cache line; this argument has been fully considered but it is not persuasive.

First, it appears to the Examiner that Applicant is reading limitations from the specification into the claims; the claims require "a source broadcast request for data" and nothing in the claims further limits/defines this limitation; therefore, this limitation is interpreted according to the broadest reasonable interpretation.

Armilli clearly teaches a source broadcast request for data as **["a first agent... issues a modifying transaction 150a (i.e., Dclaim or RWITM) (which correspond to the claimed source broadcast request for data) on system bus 12 that targets a cache line that is indicated as shared in the cache directory 22 of at least one agent 10" (Par. 0029) and explains "one or more transactions may be issued by agents 10 on system bus 12" (Par. 0021) and "data processing system 8 that**

employ a system bust architecture that permits all agents 10 to receive each transaction, snoop response, and combined response at substantially the same time” (Par. 0028) (*wherein as all agents 10 receive the modifying transaction, this transaction is being broadcast*)] wherein the modifying transaction is broadcast/sent to all agent(s) having the cache line to be modified by the first agent in a shared state wherein these agent(s) send snoop responses to the first agent in order to process the granting of ownership to the first which will allow the first agent to modify the cache line since an agent must own the cache line in order to modify it; thereby, a first agent sends a source broadcast request for data, as broadly claimed.

Furthermore, Arimilli clearly teaches a source broadcast request for data as a read with intent to modify (RWITM) is one of the modifying transactions (*which correspond to the claimed source broadcast request for data*) that an agent issues wherein it is clearly explained that [**“FIG. 3B, which illustrates master 26 issuing a RWITM transaction on system bus 12 to obtain a copy (*which comprises a request for data*) of the cache line from another agent 10 for modification” (Par. 0035)**].

Appellant argues Arimilli does not disclose “a first node, when responding in a first manner, provides a first response to the other broadcast requests for the data indicating that the first node has a conflicting read request for the data;” since in Arimilli the CDP, not the first agent protects the grant of ownership until the combined response is received at the first agent.

However, the Examiner disagrees. The claims broadly require “a first node, when responding in a first manner, provides a first response to the other broadcast requests for the data indicating that the first node has a conflicting read request for the data;” wherein Appellant should note that the limitation of “the first agent protecting grant of ownership while the source broadcast request for data is pending at the first node” is not being claimed.

Arimilli discloses “a first node, when responding in a first manner, provides a first response to the other broadcast requests for the data indicating that the first node has a conflicting read request for the data;” as **[every agent is able to provide snoop responses indicating conflicting requests (Par. 0012 and 0035-0038) and explains “snooper 28 at block 130 that the associated master 26 has a pending conflicting modifying request, snooper 28 provides a RETRY_notCDP SR (*which corresponds to responding in a first manner, as claimed*) to signify that the agent 10 has a pending conflicting request (*which corresponds to a pending request for data, as claimed*) and believes it may ultimately be granted ownership of the target cache line” (Par. 0052)]**.

Claim 6

Appellant argues Arimilli does not disclose “second agent 10 is operative to fill a shared copy of data received from a third node in response to one of the other source broadcast requests for data;” however the Examiner disagrees as Arimilli clearly discloses this limitation as **[“The RWITM (*which corresponds to a source broadcast***

request for data as claimed) **transaction requests that the initiating agent be provided an up-to-date copy** (*wherein providing an up-to-date copy from one agent to another corresponds to filling a shared cache copy of data from one node to another as claimed*) **of a target cache line and that other agents invalidate their copies of the cache line, if any” (Page 1, Pars. 0006) wherein “FIG. 3B, which illustrates master 26 issuing a RWITM transaction on system bus 12 to obtain a copy** (*wherein obtaining a copy of a line from another agent corresponds to filling a shared cache copy of data from one node to another as claimed*)**of the cache line from another agent 10 for modification” (Par. 0035)].**

Furthermore, Examiner would like to point out that the functional recitation of “the second node being [capable of or] operative to fill a shared copy of data” does not make the claimed invention patentably distinct over the prior art of record. While features of a system may be recited either structurally or functionally, claims directed to a system must be distinguished from the prior art in terms of structure rather than function. *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997) (The absence of a disclosure in a prior art reference relating to function did not defeat the Board’s finding of anticipation of claimed apparatus because the limitations at issue were found to be inherent in the prior art reference); see also *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 228-29 (CCPA 1971);< *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). “System claims cover what a device *is*, not what a device *does*.” *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original).

Still further, claim 6 recites, inter alias, "the second node being [capable of or] operative to fill a shared copy of data". While these limitation requires "a second node", the functional recitation: "fill a shared copy of data" does not distinguish the claims from the prior art.

Claim 7

Appellant's arguments with respect to claim 7 parallel those presented with respect to claims 5 and 1. Accordingly, these arguments are addressed at least in the manner that claims 5 and 1 have been addressed above.

Claim 8

Appellant argues that Arimilli does not disclose "a second response to the other source broadcast requests for the data indicating that the source broadcast request from the first node is a conflicting request for the data and that migration of the data to the first node in progress" as "in Arimilli, after the combined response 154a is received in the processor complex 10a, the processor complex 10a can protect its ownership of a target cache by providing appropriate snoop responses (See Arimilli, Par. [0033]). However, Arimilli does not disclose that such appropriate snoop responses could be an indication of a conflicting request for the data and that migration of the data to the first node is in progress" (Pages 33-34 of Appeal Brief).

This argument has been fully considered but it is not deemed persuasive.

Arimilli clearly discloses snoop responses by an owner agent can be indication of a conflicting request as [**“it is imperative that the ownership of the target cache line by processor complex 10a (i.e., the new owner) be protected against other conflicting transactions during interval 160...Following interval 162, that is, during interval 164 between receipt of the combined response 154a and the close of interval 160, processor complex 10a can protect its ownership of the target cache line by providing appropriate snoop responses” (Par. 0033)** wherein it is clearly disclosed **“FIG 3A... master performing a the store into its cache array 24. In addition to maintain coherency, master 26 performs clean-up operations to invalidate other (now stale) copies of the target cache line, if any, held by other agents 10, and further, to ensure that the associated snooper 28 provides snoop responses informing masters 26, if any, that lost the arbitration” (Par. 0038)** (*wherein it is clear to one of ordinary skill in the art that these snoop responses indicate conflicting requests since processor complex 10a is protecting itself from conflicting transactions from other processors*) and also that snoop responses by an owner agent can be indication that migration of data to the first node is in progress as [**“master 26 prevents access to the target cache line by other agents 10 by means of appropriate snoop responses until the store (which comprises migration of data into a cache line) into the cache array 24 is completed” (Page 4, Paragraph 0036);** (*thereby providing snoop responses to conflicting requests while storing/migrating data into cache*) **and explains [“The RWITM (which corresponds to a source broadcast request for data as claimed) transaction requests that the initiating agent be**

provided an up-to-date copy (*wherein providing an up-to-date copy from one agent to another corresponds migration of data as claimed*) **of a target cache line and that other agents invalidate their copies of the cache line, if any” (Page 1, Pars. 0006) wherein “FIG. 3B, which illustrates master 26 issuing a RWITM transaction on system bus 12 to obtain a copy** (*wherein obtaining a copy of a line from another agent corresponds to migrating data as claimed*) **of the cache line from another agent 10 for modification” (Par. 0035)];** (*wherein it is clear to one of ordinary skill in the art that these snoop responses indicate migration of data as claimed*).

Claim 9

Appellant argues Arimilli does not disclose “employing a copy of data for a single use;” however, the Examiner disagrees and would like to point out that “a single use” as broadly claimed is clearly disclose by Arimilli as [**“coherency protocols typically require that only a single agent can own each line at any given time for purposes of modification” (Page 3, Paragraph 0033)]** wherein “modification” comprises a single use.

Examiner would also like to point out that the functional recitation of “the second node being [capable of or] operative to employ a copy of the data” does not make the claimed invention patentably distinct over the prior art of record. While features of a system may be recited either structurally or functionally, claims directed to a system must be distinguished from the prior art in terms of structure rather than function. *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997) (The

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absence of a disclosure in a prior art reference relating to function did not defeat the Board's finding of anticipation of claimed apparatus because the limitations at issue were found to be inherent in the prior art reference); see also *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 228-29 (CCPA 1971); < *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). "System claims cover what a device *is*, not what a device *does*." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original).

Still further, claim 9 recites, inter alia, "the second node being [capable of or] operative to employ a copy of the data." While these limitation requires "a second node", the functional recitation: "employ a copy of the data" does not distinguish the claims from the prior art.

Furthermore, Appellant should note that the limitation "for a single use" is referring to intended use of the claimed invention and a recitation directed to the manner in which a claim is intended to be used does not distinguish the claim from the prior art if prior art has the capability to do so (See MPEP 2114 and Ex Parte Masham, 2 USPQ2d 1647 (1987)).

Claims 12-14

Appellant's arguments with respect to claims 12-14 parallel those presented with respect to claim 1. Accordingly, these arguments are addressed at least in the manner that claim 1 has been addressed above.

Claim 16

Appellant argues Arimilli does not disclose a source broadcast read request for data since RWITM and Dclaim transactions are not source broadcast read request for data; however, the Examiner would like to respectfully point out that Appellant has failed for further define or limit the limitation “source broadcast read request for data” in the claims; therefore, this limitation has been interpreted according to the broadest reasonable interpretation.

Appellant argues that Arimilli does not disclose “a source processor node that provides a source broadcast read request for data;” however the Examiner strongly disagrees as Arimilli discloses [**“a first agent... issues a modifying transaction 150a (i.e., Dclaim or RWITM) on system bus 12 that targets a cache line that is indicated as shared in the cache directory 22 of at least one agent 10” (Par. 0029) and explains “one or more transactions may be issued by agents 10 on system bus 12” (Par. 0021) and “data processing system 8 that employ a system bust architecture that permits all agents 10 to receive each transaction, snoop response, and combined response at substantially the same time” (Par. 0028)] wherein a RWITM is a read with intent to modify transaction (therefore, comprising a source broadcast read request for data) and the RWITM transaction is broadcast/sent to all agent(s) as claimed].**

Appellant argues Arimilli does not disclose that “the source processor node issues an invalidate command in response to receiving a data response that transfer a copy of the data and a cache ordering point for the data to the source processor node;” this argument has been fully considered but it is not deemed persuasive.

Arimilli discloses “the source processor node issues an invalidate command in response to receiving a data response that transfer a copy of the data and a cache ordering point for the data to the source processor node;” as **[“master 26 handles the store request according to the coherency state associated with the request address in the cache directory 22... if, however, cache directory 22 indicates the target cache line identified by the request address is invalid... master 26 issuing a RWITM transaction (*which corresponds to the claimed source broadcast read request*) on system bus 12 to obtain a copy of the cache line (*which corresponds to transferring a copy of data to source processor as claimed*) from another agent 10 for modification”** (Page 4, Par. 0035) wherein “a first agent... issues a modifying transaction 150a (i.e., Dclaim or RWITM) on system bus 12 that targets a cache line that is indicated as shared in the cache directory 22 of at least one agent 10... master 26 of processor complex 10a stores to the target cache line and completes associated clean-up operations (*which correspond to the claimed invalidate command as they are sent to invalidate data in other nodes (Par. 0038)*)” (Pars. 0029 and 0038)].

Arimilli discloses the claimed cache ordering point as the **[coherency decision point (CDP)** (*which corresponds to the claimed cache ordering point*) **which “is the**

snooper of the agent 10 that holds the data of the target cache line in the highest state of ownership” and explains “the CDP grants (*which clearly comprises an ownership data response*) ownership of the target cache line to other agents 10 by providing appropriate snoop responses to the transactions during the snoop response periods” wherein “the combined response informs an agent 10 that issued a transaction whether or not it “won” the arbitration performed by the CDP and is the new owner of the target cache line (and also the new CDP in the preferred embodiment) ” (Pars. 0030-0032)] wherein in Arimilli, the new owner becomes the new CDP or cache ordering point; thereby transferring a cache ordering point to the new owner as claimed.

Claim 17

Appellant’s arguments with respect to claim 17 parallel those presented with respect to claim 16. Accordingly, these arguments are addressed at least in the manner that claim 16 has been addressed above.

Claim 18

Appellant’s arguments with respect to claim 18 parallel those presented with respect to claims 1 and 8. Accordingly, these arguments are addressed at least in the manner that claims 1 and 8 have been addressed above.

Claim 19

Appellant's arguments with respect to claim 19 parallel those presented with respect to claims 1 and 8. Accordingly, these arguments are addressed at least in the manner that claims 1 and 8 have been addressed above.

Claim 20

Appellant's arguments with respect to claim 20 parallel those presented with respect to claims 1, 6 and 16. Accordingly, these arguments are addressed at least in the manner that claims 1, 6 and 16 have been addressed above.

Claim 21

Appellant's arguments with respect to claim 21 parallel those presented with respect to claims 18 and 16. Accordingly, these arguments are addressed at least in the manner that claims 18 and 16 have been addressed above.

Claim 22

Appellant's arguments with respect to claim 22 parallel those presented with respect to claim 9. Accordingly, these arguments are addressed at least in the manner that claim 9 has been addressed above.

Claim 25

Appellant's arguments with respect to claim 25 parallel those presented with respect to claim 16. Accordingly, these arguments are addressed at least in the manner

that claim 16 has been addressed above.

Claim 26

Appellant's arguments with respect to claim 26 parallel those presented with respect to claim 25. Accordingly, these arguments are addressed at least in the manner that claim 25 has been addressed above.

Claim 27

Appellant's arguments with respect to claim 27 parallel those presented with respect to claims 26, 25 and 6. Accordingly, these arguments are addressed at least in the manner that claims 26, 25 and 6 have been addressed above.

Claim 28

Appellant's arguments with respect to claim 28 parallel those presented with respect to claims 26, 25 and 6. Accordingly, these arguments are addressed at least in the manner that claims 26, 25 and 6 have been addressed above.

Claim 29

Appellant's arguments with respect to claim 29 parallel those presented with respect to claims 26, 25 and 9. Accordingly, these arguments are addressed at least in the manner that claims 26, 25 and 9 have been addressed above.

Claim 31

Appellant's arguments with respect to claim 31 parallel those presented with respect to claims 1 and 8. Accordingly, these arguments are addressed at least in the manner that claims 1 and 8 have been addressed above.

Claims 32-33

Appellant's arguments with respect to claims 32-33 parallel those presented with respect to claims 31, 1 and 8. Accordingly, these arguments are addressed at least in the manner that claims 31, 1 and 8 have been addressed above.

Claim 34

Appellant's arguments with respect to claim 34 parallel those presented with respect to claims 1 and 16. Accordingly, these arguments are addressed at least in the manner that claims 1 and 16 have been addressed above.

Claim 35

Appellant's arguments with respect to claim 35 parallel those presented with respect to claims 34 and 18. Accordingly, these arguments are addressed at least in the manner that claims 34 and 18 have been addressed above.

Claim 36

Appellant's arguments with respect to claim 36 parallel those presented with respect to claims 35, 34 and 6. Accordingly, these arguments are addressed at least in the manner that claims 35, 34 and 6 have been addressed above.

Claim 37

Appellant's arguments with respect to claim 37 parallel those presented with respect to claims 35, 34 and 9. Accordingly, these arguments are addressed at least in the manner that claims 35, 34 and 9 have been addressed above.

Claim 39

Appellant's arguments with respect to claim 39 parallel those presented with respect to claim 1. Accordingly, these arguments are addressed at least in the manner that claims 1 have been addressed above.

Claim 40

Appellant's arguments with respect to claim 40 parallel those presented with respect to claims 1, 3, 8 and 16. Accordingly, these arguments are addressed at least in the manner that claims 1, 3, 8 and 16 have been addressed above.

Claim 39

Appellant's arguments with respect to claim 39 parallel those presented with respect to claim 1. Accordingly, these arguments are addressed at least in the manner that claims 1 have been addressed above.

B. 35 U.S.C. 103(a) rejection of claims 10-11, 23-24, 30 and 38 as being made obvious by Arimilli in view of Arimilli 2

Claims 10, 23, 30 and 38

Regarding Applicant's remark that one of ordinary skill in the art would not be motivated to combine Arimilli with the forward progress protocol of Arimilli 218 because Arimilli does not teach other source broadcast requests for the data or that the second node is operative to obtain the data; the Examiner disagrees as Arimilli clearly discloses that one node obtains data previously modified at another node **[See Response to Arguments with respect to claim 1 above]**.

The examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, both Arimilli and Arimilli 2 are directed to and involved in shared memory systems access and control and Arimilli 2 clearly discloses employing a forward process technique and indicates this is done for

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the motivation of resolving transactions if the source broadcast/snooping protocol cannot provide a deterministic resolution of the transaction thereby obviating the need for subsequent interventions or snoop/broadcast retries and obviating the modification Arimilli which discloses that one node obtains data previously modified at another node **[Arimilli (Par. 0035)]** to include a forward progress technique to obtain the data when broadcasts/snooping are not successful as taught by Arimilli 2.

Furthermore, Examiner would also like to point out that the functional recitation of “the second node being [capable of or] operative employ a forward progress technique” does not make the claimed invention patentably distinct over the prior art of record. While features of a system may be recited either structurally or functionally, claims directed to a system must be distinguished from the prior art in terms of structure rather than function. *In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997) (The absence of a disclosure in a prior art reference relating to function did not defeat the Board’s finding of anticipation of claimed apparatus because the limitations at issue were found to be inherent in the prior art reference); see also *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 228-29 (CCPA 1971);< *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). “System claims cover what a device *is*, not what a device *does*.” *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original).

Still further, claim 9 recites, inter alias, “the second node being [capable of or] operative employ a forward progress technique.” While these limitation requires “a

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second node”, the functional recitation: " employ a forward progress technique" does not distinguish the claims from the prior art.

In response to applicant's argument that Arimilli teaches away from its combination with Arimilli 2, the Examiner would like to point out that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

The Examiner would also like to point out that the reference to Arimilli does not teach away from the possibility of combining Arimilli with Arimilli 2 to obtain the claimed invention as Arimilli's disclosure does not criticize, discredit, or otherwise discourage the solution claimed *In re Fulton*, 391 F.3d 1195, 1201, 73 USPQ2d 1141, 1146 (Fed. Cir. 2004). See also MPEP 2123.

Claims 11 and 24

Appellant argues the combination of Arimilli and Arimilli 2 does not disclose “the forward progress technique comprises a forward progress cache coherency protocol” since “Arimilli fails to teach or suggest that an action intended to achieve a forward progress would include a forward progress cache coherency protocol... Instead, Arimilli

2 teaches that an action intended to achieve forward progress might include a push operation or an alteration of a coherency state” (Page 59 of Appeal Brief).

This argument has been fully considered but it is not deemed persuasive.

Appellant should note that claims 11 and 24 broadly require “the forward progress technique comprises a forward progress cache coherency protocol” and do not comprise any limitations requiring how this forward progress cache coherency protocol is being implemented; no implementation details are being claimed in claims 11 and 24; therefore, these claims have been given the broadest reasonable interpretation.

Furthermore, Appellant’s Specification defined a forward progress cache coherency protocol as “directory based or null-directory” (Par. 0037). The combination of Arimilli and Arimilli 2 discloses “the forward progress technique comprises a forward progress cache coherency protocol” as Arimilli 2 discloses [**“the mechanism of the present invention for making forward progress... which moves the coherency state of a requested cache item toward the expected coherency state at the completion of the original operation” (Col. 6, lines 39-67) wherein Arimilli 2 discloses using R_MESI wherein “the MESI protocol... the coherency state, which is indicated by bits in the cache directory” (Col. 1, line 33-40)**]; therefore disclosing a forward progress cache coherency protocol as the coherency states are changed in a directory based protocol order to achieve forward progress as claimed.

B. 35 U.S.C. 103(a) rejection of claims 15 as being made obvious by Arimilli in view of Arimilli 2 and further in view of Martin

Appellant's arguments with respect to claim 15 parallel those presented with respect to claims 11 and 24. Accordingly, these arguments are addressed at least in the manner that claims 11 and 24 have been addressed above and as follows.

In response to Applicant's arguments that one of ordinary skill in the art would not be motivated to combine the system of Arimilli with Arimilli 2 and Martin to create the system of claim 15 as Martin provides no suggestion of the ability to switch between protocols as recited in claim 15; the Examiner disagrees with Applicant's arguments as Arimilli 2 is relied upon for switching between protocols [**"making forward progress on retried snoop hits** (*which comprises snooping in a source broadcast request protocol as claimed*) **involves undertaking an action, in response to detecting an operation on the system bus which was the subject of a previous failed intervention, which moves the coherency state of a requested cache item toward the expected coherency state at the completion of the original operation** (*which comprises using forward progress protocol to reissue a request for the data in response to the request failing in the source broadcast protocol, as claimed*)" (Col. 6, lines 39-45 and 54-64; **Refer to rejection to claim 15 above**)]. The reference to Martin has only been relied upon for teaching a multiprocessor system using a hybrid cache coherency protocol as [**"directory protocol" and "snooping system" protocols used for cache coherency** (Abstract; Col. 1, lines 38-50)].

Furthermore, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Arimilli, Arimilli 2 and Martin are directed to and involved in shared memory systems access and control.

In response to applicant's argument that Arimilli teaches away from its combination with Arimilli 2 and Martin, the Examiner would like to point out that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

The Examiner would also like to point out that the reference to Arimilli does not teach away from the possibility of combining Arimilli with Arimilli 2 and Martin to obtain the claimed invention as Arimilli's disclosure does not criticize, discredit, or otherwise discourage the solution claimed *In re Fulton*, 391 F.3d 1195, 1201, 73 USPQ2d 1141, 1146 (Fed. Cir. 2004). See also MPEP 2123.

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(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Yaima Campos/

Examiner, Art Unit 2185

Conferees:

/Sanjiv Shah/

Supervisory Patent Examiner, Art Unit 2185

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